

Resistin and GFR

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To the Editor: Recently, Axelsson *et al.*¹ showed that glomerular filtration rate was consistently associated with serum resistin levels in patients with chronic kidney disease. It was found that the significant relationship between plasma resistin levels and insulin resistance was lost after adjustment for glomerular filtration rate, leading to the conclusion that renal function is an important factor to take into account when relating insulin sensitivity to inflammatory biomarkers in patients with kidney disease or diabetes mellitus. We have data from a population-based cohort of 64-year-old women, consisting of women with known and new diabetes (diabetes mellitus, $n = 229$), impaired glucose tolerance ($n = 210$), and normal glucose tolerance ($n = 191$).² Diabetes mellitus, impaired glucose tolerance, and normal glucose tolerance were defined according to the World Health Organization classification. The serum levels of resistin were measured with an enzyme-linked immunosorbent assay kit (R&D Systems Europe, Abingdon, UK). The characteristics of the subjects are presented in Table 1. Serum creatinine did not differ

Table 1 | Characteristics of the subjects (geometric means \pm s.d.) ($n=630$)

	DM ($n=229$)	IGT ($n=210$)	NGT ($n=191$)
Serum resistin (ng/ml)	10.8 ± 3.6	10.2 ± 3.7	$9.9 \pm 3.2^{**}$
Serum creatinine ($\mu\text{mol/l}$)	89 ± 14	89 ± 11	89 ± 10
BMI (kg/m^2)	28.8 ± 4.9	27.1 ± 5.0	$25.8 \pm 3.5^*$
Blood glucose (mmol/l)	7.1 ± 2.8	5.0 ± 0.6	$4.7 \pm 0.5^*$
Serum HDL cholesterol (mmol/l)	1.45 ± 0.43	1.56 ± 0.42	$1.74 \pm 0.42^*$
White blood cell count ($\times 10^9/\text{l}$)	6.6 ± 1.8	6.1 ± 1.8	$5.6 \pm 1.5^*$
C-reactive protein (mg/l)	1.9 ± 10.3	1.3 ± 3.7	$1.3 \pm 2.5^*$

Abbreviations: BMI, body mass index; DM, diabetes mellitus; HDL, high-density lipoprotein; IGT, impaired glucose tolerance; NGT, normal glucose tolerance; s.d., standard deviation.

* $P < 0.001$; ** $P = 0.006$.

between the groups and correlated positively to serum resistin (Spearman's correlation coefficients 0.36 ($P < 0.01$), 0.28 ($P < 0.01$), and 0.15 ($P < 0.05$) for the diabetes mellitus, impaired glucose tolerance, and normal glucose tolerance groups, respectively). In a multivariate analysis, serum creatinine remained associated with resistin after adjustment for C-reactive protein, white blood cell count, high-density lipoprotein cholesterol, body mass index, glucose tolerance group, and plasma insulin (partial correlation coefficient 0.33, $P < 0.001$). These data indicate that the association between glomerular filtration rate and serum resistin also represents a physiological mechanism that not necessarily is linked to kidney disease.

1. Axelsson J, Bergsten A, Qureshi AR *et al.* Elevated resistin levels in chronic kidney disease are associated with decreased glomerular filtration rate and inflammation, but not with insulin resistance. *Kidney Int* 2006; **69**: 596–604.
2. Brohall G, Behre CJ, Hulthe J *et al.* Prevalence of diabetes and impaired glucose tolerance in 64-year-old Swedish women. *Diabetes Care* 2006; **29**: 363–367.

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Is there a link between inflammation, plasma resistin levels, and protein malnutrition in hemodialysis patients?

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To the Editor: Similarly to the article by Axelsson *et al.*¹ entitled 'Elevated resistin levels in chronic kidney disease are associated with decreased glomerular filtration rate and inflammation, but not with insulin resistance' we have recently observed in 33 non-diabetic hemodialysis patients that elevated resistin plasma levels are not associated with insulin resistance. In addition, we detected for the first time in human subjects that resistin levels are inversely correlated with the protein catabolic rate ($r = -0.416$, $P = 0.025$), which is known to parallel the dietary protein uptake (Figure 1).² Axelsson *et al.*¹ have not reported on this important aspect in their manuscript despite the high prevalence of protein and energy malnutrition in hemodialysis patients and in patients with chronic kidney disease.

The finding by Axelsson *et al.*¹ that plasma resistin levels are strongly correlated with inflammatory markers and

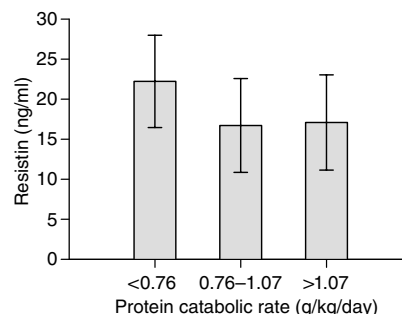


Figure 1 | Hemodialysis patients ($n = 33$) were divided into three groups of 11 patients each according to the protein catabolic rate. The patients with the lowest protein catabolic rate exhibited the highest resistin levels. These intergroup differences are statistically significant ($P < 0.05$).